Deploying Apps to the Cloud
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Agenda

• Cloud Overview
• ArcGIS Cloud Deployment Models
• Patterns and Use Cases
• Options and Considerations
• Challenges and Lessons Learned
Cloud Overview
<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>NIST Definition (summary)</th>
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<tbody>
<tr>
<td>Infrastructure as a Service (IaaS)</td>
<td>The capability provided to the consumer is to <strong>provision processing, storage, networks, and other fundamental computing resources</strong> where the consumer is able to deploy and <strong>run arbitrary software</strong>, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).</td>
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<tr>
<td>Platform as a Service (PaaS)</td>
<td>The <strong>capability provided to the consumer is to deploy onto the cloud infrastructure</strong> consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, consumer servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.</td>
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<td>Software as a Service (SaaS)</td>
<td>The capability provided to the consumer is to <strong>use the provider’s applications running on a cloud infrastructure.</strong> The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.</td>
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</table>
Infrastructure as a Service (IaaS)

- Managed infrastructure
  - Hardware
  - Storage
  - Load Balancing
  - Etc.
- Self-provisioning
  - Virtual Machines
  - Bare Metal
- Pay for what you use
Platform as a Service (PaaS)

- Infrastructure + software / tools
- Developers create applications on the provider’s platform over the Internet
- Pay for what you use
Software as a Service (SaaS)

- Infrastructure + platform + software / custom apps
- Examples
  - Salesforce.com
  - ArcGIS Online
## Cloud Deployment Models

<table>
<thead>
<tr>
<th>Cloud Type</th>
<th>NIST Definition (summary)</th>
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<tbody>
<tr>
<td><strong>Public</strong></td>
<td>Public cloud. The cloud infrastructure is provisioned for <strong>open use by the general public</strong>. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.</td>
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<tr>
<td><strong>Private</strong></td>
<td>The cloud infrastructure is provisioned for <strong>exclusive use by a single organization</strong> comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.</td>
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<tr>
<td><strong>Community</strong></td>
<td>Community cloud. The cloud infrastructure is provisioned for <strong>exclusive use by a specific community of consumers</strong> from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.</td>
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<tr>
<td><strong>Hybrid</strong></td>
<td>The cloud infrastructure is a <strong>composition of two or more distinct cloud infrastructures</strong> (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).</td>
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</tbody>
</table>
Benefits of Cloud Computing

- Increase efficiency and business focus –
- High availability, quality and performance –
- Reduce internal costs –
- Preserves data integrity, privacy and availability –
- Increase usage and productivity –
ArcGIS Cloud Options
ArcGIS Cloud Options

- **SaaS**
  - ArcGIS Online or Custom Esri Apps and Data on fully Managed Cloud Services

- **PaaS**
  - ArcGIS for Server on Esri managed cloud infrastructure

- **IaaS**
  - ArcGIS for Server images available to use on cloud infrastructures
ArcGIS for Server on [Fill in the Blank]

- Supported on multiple cloud platforms
  - Virtual or bare metal
- Full ArcGIS for Server capabilities
- User-provisioned cloud infrastructure resources
- Pay for what you use
- BYOL or ArcGIS term licensing available
ArcGIS Online

- Create, share, collaborate
- Subscription-based
  - Named User
  - Credits – pay as you go
- Updates and enhancements occur behind the scenes
Esri Managed Cloud Services

- Cloud-based GIS infrastructure support, including:
  - Enterprise system design
  - Infrastructure management
  - Software (Esri & 3rd Party) Installation, updates and patching
  - Application deployment
  - Database management
  - 24/7 support and monitoring
ArcGIS Cloud Deployment Models
Deployment Models

- **ON-PREMISES**
  - Application
  - OS/DB/NETWORK
  - Security
  - Infrastructure

- **Esri IMAGES & CLOUD BUILDER**
  - FedRAMP Moderate Compliant

- **Esri MANAGED CLOUD SERVICES**

- **ArcGIS ONLINE**
  - FISMA Low ATO

Customer Managed: ▼
Esri Managed: ▼
CSP Managed: ▼

Esri Compliance & ATO Scope
IaaS ATO Scope
Deploy ArcGIS on-premises, in public clouds (PaaS), and/or use Esri’s cloud (SaaS)
Patterns and Use Cases
Sandbox in the Cloud
Data Center Consolidation Initiative

Reducing costs and improving GIS operations

3 month proof of concept
Testing day to day editing workflows
Evaluating ArcGIS for Desktop in the cloud

Washington
Oregon
California
Nevada
Utah
Arizona
Colorado
Idaho
Montana
Wyoming
New Mexico
South Dakota
Prototyping and Testing New Technology

Evaluate Prior to Making Significant Investments

Short-Term Engagements

Gain Management Buy-In and Adoption

chick-fil-a

national grid
Public Facing Apps
Interactive Investor Handbook Map

Sharing select information with stakeholders
Accessible Food Assistance Information

Easy access to nutrition assistance resources

Supplemental Nutrition Assistance Program
Business Critical Apps
Improved Sales Execution in the Field

Rapid enablement with ArcGIS Server in the cloud

Esri-managed cloud environment

2.7 million records processed daily

Automated processing and updates
Apps with Fluctuating Usage
Enterprise System & Outage Viewer

Bringing critical outage information to the general public

Highly available, scalable systems ready to perform during major events

Frequent, automated data updates
Large Cloud Migration Initiatives

Push to move State & Local Govt resources to the cloud
Streamline Environment Review Process

Web based decision support tools available in the cloud

Managing partner apps in the cloud

Migration from on-premises deployment

Upgrade from legacy ArcIMS systems
Federal Apps
Providing State Profile Data to the Public

Dynamic Services Provide Up to Date Energy Information
USGS Topo Maps Publicly Available

- More than 175,000 topographic maps published by the USGS since 1884
- 22 TB data x 2 for redundancy
- 1.6 million hits during Esri User Conference
- Consumed by several apps; premium service available in ArcGIS Online
Apps with Elevated Security Requirements
Cloud Security and Compliance

FedRAMP

FISMA

HIPAA

CJIS

PCI Security Standards Council

ISO 27001 Certified
Supporting Small Business Development

Simple-to-use application for siting new businesses

Business Development Tool—Small Business Edition

Link Census economic and demographic data

Cloud security controls meet federal standards
Options and Considerations

Understand what makes sense for the business... how do you know cloud is the way to go?
Why aren’t organizations moving to the cloud?

- Meeting Organizational Security Requirements
- Overcoming IT Cultural Barriers
- Network Infrastructure Requirements
- Expertise for Acquisition Process
- Funding for Implementation
<table>
<thead>
<tr>
<th>Should I be using the cloud or not?</th>
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</table>

**When should I use the cloud?**

- Lack of experience and people
- Cost to maintain in house is unsustainable
- I want to focus on new projects but managing my server is taking up too much time
- I want to quickly prototype and test out new capabilities
- I need an environment that scales

**When shouldn’t I use the cloud?**

- Heavy data editing workflows
- “If it ain’t broke, don’t fix it!”
- Experienced IT resources readily available
- Strict security policies not allowing data off premises
What are the pricing options and considerations?

Private Clouds need to live somewhere

- When to use a cloud, a colocation data center, or an owned data center

- Apples-to-apples comparison for each to show how to avoid hidden costs and gotchas

Over 60% of organizations engage in colocation, but 70% maintain their own – Info Tech Resource Group
Key Points - Organization owned data center

- Full Control
  - Your policies and procedures

- Hardware lifecycle
  - Facilities hardware

- Ownership
  - SLA’s, Audits, Accountability
Key Points-Collo & Cloud data center

- **Full Control**: Their policies and procedures
- **Hardware lifecycle**: Their Facilities hardware
- **Ownership**: Their SLA’s, Audits, Accountability
Of course, What a Data Centers “is” varies…
I have witnessed it all with small and fortune 100 companies
When to use your data center

- It all depends on the conditions of your existing legacy data center
  - Age of infrastructure
  - Power, space available
  - Meets reliability requirements

- It all depends on the business requirements
  - SLA's and availability requirements
  - Planned and unplanned growth
  - Audit Requirements
  - Future personnel resource requirements
When to use a Collocation provider data center

- When you are low or running out of power and space
- When business requirements are unknown
- Unqualified or lack of personnel
- Inter-site connectivity
- Budget constraints
- When your data center cannot meet requirements for:
  - SLA’s
  - Audits
  - Future growth
  - Support activities
When to use a Cloud provider

- Infrastructure sizing
  - SaaS, IaaS, PaaS
- Auto scaling for unknown number of users/hits
- Lack of personnel
- Budget constraints and Pay-as-you-go
- Time to market critical
- In-house network constraints
- Hardware architectural size unknown
Comparisons and Gotchas

• Create a template for apples to apples for comparisons

• Determine costs for your own IT & data center cost and limitations

• Determine Costs from the different cloud and colocation providers
Pricing Collocation Considerations

- Future site locations
- ROFR (Right Of First Refusal)
- Multiple RFP's
- Network costs
- Contract ending clauses
- Limited growth

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<thead>
<tr>
<th>1,3,5 Year Term – ? kW</th>
<th>Price</th>
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<tr>
<td>Capex Power</td>
<td>$$$$</td>
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<td>Capex Space</td>
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<td>Capex Internet</td>
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<td>Capex Burstable Internet</td>
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<td>Capex Cross Connect</td>
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<td>Capex Totals</td>
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<td>Monthly Power</td>
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<td>Monthly Space</td>
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<td>Monthly Internet Access (1Gb)</td>
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<td>Monthly Burstable Internet</td>
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<td>Monthly Cross Connect</td>
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<tr>
<td>Inter-Site Connectivity</td>
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<tr>
<td>Monthly Totals</td>
<td>$$$$$</td>
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Power is a game changer

In general every 1.8F that you raise the temperature in your data center, you save 2-4% of your total energy bill

- 91 watts vs 70 watts processors = 21 watts / processor
- 21 watts x 2 processors = 42 watts savings
- 42 watts x 8760hrs / 1000 = 368 kwh
- 368kwh x $0.07/kwh = $25.75 per server

- 140 racks / 5000sqft DC 13 servers / rack
- 140 racks x 13 servers / rack = 1680 servers
- 1680 x $25.75 x 2 = $86,520

http://www.eia.gov/electricity/state

Power is a huge factor by location
Pricing Cloud Considerations

- Compare the like features
- Ensure they have the features you need
  - Shared storage, monitoring, etc.
- Reduced saving for long term commitments
- Contract ending clauses
- Ability to automate
- Unlimited growth

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<thead>
<tr>
<th>Cloud (Acme)</th>
<th>QTY</th>
<th>unit cost</th>
<th>NRC</th>
<th>MRC</th>
<th>Annual Costs</th>
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<tbody>
<tr>
<td>Acme CloudFront</td>
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<td>Acme Dynamo DB</td>
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<td>Acme Simple Email Service</td>
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<td>Acme Simple Storage Service</td>
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<td>Acme Simple Workflow Service</td>
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<td>Acme SimpleDB</td>
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<td>Acme Virtual Private Cloud</td>
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<td>Acme Data Pipeline</td>
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<td>Acme Data Transfer</td>
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<td>Acme Direct Connect</td>
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<td>Acme Import/Export</td>
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<td>Acme Storage Gateway</td>
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<td>AcmeSupportBusiness</td>
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<td>AcmeSupportDeveloper</td>
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<td><strong>Sub-total</strong></td>
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Owned Data Center considerations

- Capitol expenditures
- Preventative maintenance cost for UPS, generators, HVAC
- Generator fuel cost
- Miscellaneous maintenance cost for prior years
- Anticipated maintenance cost, batteries capacitor replacement, etc.
- Personnel costs
- Testing
Collocation Gotchas

- Future site locations (national/global)
- ROFR (Right Of First Refusal)
- Multiple RFP’s
- Network costs
- Contract ending clauses
- Limited growth
Cloud Gotchas

- More expensive in the long run?
- Very easy to overspend
- Lack of standard processes for allocating cloud resources
- Lack of reviewing and monitoring expenses
- Shutting down of unused resources
- Experience and training using Cloud
Challenges and Lessons Learned
What to keep in mind...technical

- Take snapshots frequently!
- Be up to date on cloud certifications and compliance
- Don’t assume your apps will just work – be prepared to test
- Utilizing the cloud is a shared responsibility
- Automate whenever possible
- Use monitoring tools and be proactive
- Continuously maintain, patch and update
What to keep in mind...business

- Assess ROI for moving to the cloud
- Longer term commitments can offer significant discounts
- Frequently monitor your accounts, turn things off that are not being used
- If you have multiple accounts, separate them by business unit or function
- Analyze multiple cloud vendors and weigh pros and cons
- Consider using more than one cloud vendor
Questions
Thank you…

- Please fill out the session survey in your mobile app
- Select Deploying Apps to the Cloud in the Mobile App
  - Use the Search Feature to quickly find this title
- Click “Technical Workshop Survey”
- Answer a few short questions and enter any comments
Understanding our world.